

Barriers and guidelines in adaptation policy making: Taking stock, analysing congruence and providing guidance

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Abstract

Public policies that aim to facilitate adaptation to climate change represent a relatively young and complex policy field. As the literature on adaptation policies points out, numerous barriers impede their development and implementation. Among the barriers are e.g. the often-complained lacks of awareness, certainty, resources and political commitment. Since these and several other barriers can be overcome (e.g. by raising awareness and by increasing resources), decision-support frameworks (e.g. written guidelines) have been developed that aim to do exactly this: facilitate adaptation policy making, inter alia by highlighting barriers and by suggesting procedures and tools to overcome them. Surprisingly, most of the guidelines are hardly linked to the scientific literature on barriers, at least they do not provide respective references. The present paper closes this gap by linking research on barriers and existing guidelines for adaptation policy making as follows: In a first step, it takes stock of the barriers addressed in the adaptation policy literature and provides a structure following the policy cycle. In a second step, it briefly reviews the characteristics and the contents of 33 guidelines. In a third step, it analyses the contents of the guidelines thoroughly and compares it with the barriers identified earlier. The analysis shows that barriers do play a key role in most of the guidelines analysed. Nevertheless, the consistency between the barriers identified in the literature and those addressed in the guidelines varies considerably from guideline to guideline and from barrier to barrier. Overall, the paper shows that the development of adaptation policy guidelines seems to be based more on experience than on a systematic review of existing knowledge.

1. Adapting to climate change: introducing an emerging policy field

As the climate changes, individual and societal adaptation to new climatic and environmental conditions becomes increasingly important. Although adaptation to climate change, i.e. the adjustment in natural or human systems in response to actual or expected climatic changes or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2001, 2007), has been the rule rather than the exemption throughout the history of humankind, the unprecedented pace of anthropogenic climate change suggests that ‘adaptation as usual’ may not suffice (Berkhout, 2005). As Cimato and Mullan (2010) explain, people are expected “to take autonomous action to adapt when it is in their interest and power to do so; that is, they will take measures where the private benefits outweigh the costs to them” (Cimato & Mullan 2010, 16). However, Cimato & Mullan (2010,

17) as well as Berkhout (2005) also emphasise that autonomous adaptation (i.e. adaptation by individuals, organisations and businesses without political intervention) can fail for several reasons (e.g. because those affected by climate change are not aware of the need to adapt or do not have the necessary capacities, resources or enabling context factors to do so).

Because autonomous adaptation will often be inadequate, and because inadequate adaptation will usually imply negative (macro-)economic consequences (Cimato & Mullan 2010, 18), many governments around the world have recognised the need to facilitate climate change adaptation with a broad variety of public policies (for the international level see Burton et al. 2006; for the EU see Rayner & Jordan 2010; for OECD and EU countries see Bauer et al. 2011; Biesbroek et al. 2010; for further reasons that require adaptation policies, see Füssel 2008). So far, however, governments are mainly concerned with formulating adaptation policies (e.g. in adaptation strategies), and with establishing governance structures and mechanisms that are supposed to facilitate their implementation in coordinated and knowledge-based ways (Bauer et al. 2011; Biesbroek et al. 2010). The only adaptation policies that have been implemented to a noticeable degree so far are informational instruments such as government-sponsored studies, websites and campaigns that aim to raise awareness for climate change and respective adaptation needs (Biesbroek et al. 2010, 445).

Since adaptation policy making is a relatively young and complex policy field (Ford 2008), those who study it often highlight a plethora of difficulties (here referred to as barriers) hindering adequate progress. Among them are e.g. a lack of political leadership, inadequate financial resources (both major concerns also in many other policy fields), a lack of awareness for adaptation needs, and problems in coping with complexities and uncertainties of climate change (see e.g. Lorenzoni et al. 2007; Dessai et al. 2009). While these and many other barriers often hinder adaptation policy making, a series of decision-support approaches and frameworks (often presented as guidelines) have been developed with the explicit aim to support policy makers in their work on adaptation. Although the numerous guidelines are diverse with regard to who developed them for what target group and for what purpose, most of them provide either explicit or implicit guidance on how to identify and overcome barriers of adaptation (see e.g. UKCIP, Danish Web Portal, German Adaptation competition).

Despite the fact that both, barriers and guidelines can (co-)determine the success or failure of adaptation policy making, the two closely related issues have not been analysed and compared systematically so far. On the one hand, barriers are usually analysed by researchers in case studies, and it is a challenge in its own right to take stock of the diverse collections of barriers. On the other hand, guidelines are often developed by researchers or policy consultants without explicit reference to the literature that is concerned with barriers in adaptation policy making. Consequently, guidelines reflect the experiences and expertise of those who develop them rather than the insights published by others. The present paper addresses these shortcomings in adaptation research and in practical guideline development with the following research questions:

- What are the key barriers that hinder adaptation policy making as identified in the scientific adaptation policy literature? How can the barriers be organised or typologised meaningfully? In how far are the barriers specific for particular levels of government (e.g. national, provincial or local)?

- What guidelines exist that aim to facilitate public policy making on adaptation? Who developed them based on what kind of evidence, what sectoral themes do they address, whom do they target, and what is their key purpose?
- In how far do selected guidelines address the barriers identified in the adaptation literature (explicitly and implicitly)? What do they propose to overcome particular barriers?

The present paper addresses the research questions as follows. Section 2 lays the conceptual foundations for the subsequent empirical work. Section 3 summarises and organises the barriers we found in 49 sources. It provides a solid basis for analyzing respective gaps in adaptation guidelines, and it can inform policy makers about the key issues to watch out for key when developing adaptation policies. Section 4 describes 33 guidelines for adaptation policy making identified through a keyword internet search. Section 5 shows in how far all 33 guidelines address the barriers documented in the adaptation literature explicitly and 12 of them implicitly. Section 6 finally summarises the comparison between barriers addressed in the adaptation literature and in guidelines, and it provides a brief outlook on the potential and limitations of guidelines.

2. Difficulties in adaptation policy making and guidelines to overcome them: conceptual clarifications

When we began to take stock of difficulties in adaptation policy making as documented in the respective literature we had to cope with two major challenges: First, adaptation scholars use different, often ill-defined terms and concepts when researching the many difficulties hindering public policies on adaptation, and they often mix policy-related barriers with other obstacles, hindering e.g. autonomous adaptation (such as cultural or psychological ones, see e.g. ###). Second, several adaptation scholars do not simply list the difficulties they encounter but they organize them in different (often conflicting) ways. This section explains how we have addressed these two challenges. It lays the conceptual foundation for the subsequent sections by clarifying terminologies and by introducing the policy cycle as a widely accepted heuristic model that helps to better understand (adaptation) policy making, and to organize related barriers and guidelines.

The difficulties hindering adaptation policies are numerous (see section 3), and so are the concepts and terms adaptation scholars use when addressing them. They speak e.g. of problems (Berrang-Ford et al. 2011; CEPS 2008), limits (Adger et al. 2008; Moser & Ekstrom 2010), challenges (Burch 2010; Moser 2009a; Bauer et al. 2011) or barriers (Hulme et al. 2007; Storbjörk 2010; Moser & Ekstrom 2010). Although some authors use some of the terms to distinguish between adaptation difficulties with different qualities (see e.g. Moser & Ekstrom 2010), others use them synonymously without clearly defining them (see e.g. Burch 2010) on the interchangeable use of challenges and barriers. Without going into the details of what the terms mean for different authors we want to clarify what we understand when speaking of limits, barriers and challenges of adaptation in the present paper and why we focus on barriers. Based on the Fourth Assessment Report of the IPCC we define limits to adaptation as “obstacles that tend to be absolute in a real sense”, constituting “thresholds beyond which existing activities [...] cannot be maintained, not even in a modified fashion” (Moser & Ekstrom 2010, 22026; see also Adger et al. 2008, 3). In short, limits are (usually physical) limitations for any kind of adaptation (including adaptation policies) that cannot be overcome (Adger et al. 2008). In contrast, barriers are “obstacles that can be overcome with concerted effort, creative management,

change of thinking, prioritization, and related shifts in resources, land uses, institutions, etc.” (Moser & Ekstrom 2010, 22027; see also Jones 2010, 2). While this definition includes barriers of autonomous adaptation (such as cultural or psychological ones, see e.g. Hulme et al. 2007; Jones 2010), the present paper focuses on policy-related barriers that hinder adaptation policy making but that can be overcome, not least with approaches and tools (such as guidelines) that aim to support adaptation policy making.

Approaches that aim to support policy makers to develop and implement adaptation policies are as numerous and diverse as the barriers identified in the adaptation policy literature. Based on the UNFCCC (2008), an adaptation decision support (there refer to adaptation methodology or approach) can be defined as a complete framework that prescribes an entire process and assembles certain methods and tools to support decision making. Examples for decision support approaches in the form of guidelines are e.g. the “Adaptation Policy Framework” (Lim et al. 2004) and the “Design of guidelines for the elaboration of Regional Climate Change Adaptation Strategies (Ribeiro et al. 2009); examples for online approaches are e.g. the Adaptation Wizard in the UK (<http://www.ukcip.org.uk/wizard/>) and the “Klimalotse” in Germany (www.klimalotse.anpassung.net/). Since adaptation scholars do not always agree on what “decision support” actually means, Moser (2009:11) criticises the term as a “grab bag” meaning “almost anything that somehow links the research sphere with the practical realm – processes of interaction, different forms of communication, potentially useful data sets or models, reports and training workshops, data ports and websites”. Nevertheless, such approaches usually share the intention to support policy-makers (and others) in the process of adaptation (Moser 2009). The present paper focuses on written guidelines as one form of decision support because they are to date the most widespread and easily accessible approach, usually providing implicit or explicit guidance on how to address barriers in adaptation policy making. In the next few years, it will be interesting to see in how far guidelines were able to actually support adaptation policy making. What we can assess today is how coherent different guidelines are and how systematically they address barriers hindering adaptation policy making.

Instead of arbitrarily listing barriers and comparing them with the contents of adaptation guidelines, we were searching for an analytical framework that helps to organize both the barrier stocktaking and the systematic comparison with adaptation guidelines. Since both the literature on barriers (e.g. Moser & Ekstrom 2010) and the adaptation guidelines (e.g. Willows & Connell 2003, Lim & Spanger-Siegfried 2004, Brown et al. 2011) employ more or less explicitly the idea of the ‘policy cycle’, we also use the heuristic model that disaggregates policy-making into consecutive stages and sub-stages. Since the actual policy cycle models vary considerably in the adaptation policy literature (see e.g. Moser & Ekstrom 2010; UKCIP 2007), we resort to the ‘standard policy cycle’ that disaggregates policy making into the four stages of agenda setting, policy formulation, policy implementation, and evaluation (for an overview see Jann & Wegrich 2003; Howlett & Ramesh 2003).

Most policy cycle models regard agenda setting as the first stage of policy making. To be addressed politically, an issue or a problem has to be recognised and understood properly. Context factors such as the nature of the problem, events, the values, interests, resources and power relations of competing state and non-state actors (such as business, civil society organisations and the media) as well as resulting public discourses all shape agenda setting processes (Howlett & Ramesh 2003, 121-125). Because political agendas are usually crowded with pressing and often well-defined (economic

and social) problems (Jann & Wegrich 2003, 84), ill-defined (environmental) problems that cross political responsibilities horizontally and levels of governmental authority vertically often have difficulties in gaining the attention of policy makers (Jordan & Lenschow 2008). Once a problem is on the political agenda the responsible political actors are supposed to respond by deciding on, formulating and adopting adequate policies. Ideal typically, policy makers start with exploring and assessing different options on how to solve the problem (Howlett & Ramesh 2003, 143). The attractiveness of an option depends on expected costs and benefits (Jann & Wegrich 2003, 87) and, again, on numerous context factors, including the values, interests, resources and power relations of the involved actors and the affected target groups (Smit & Pilifosova 2001, 893). Once policy makers decide on, formulate and adopt a policy it has to be implemented, i.e. it has to be put into concrete terms and made operational. Implementation research has highlighted that numerous gaps between legislative or political intent and administrative practice can seriously impede the effectiveness of policies (Howlett/Ramesh 2003). Moreover, conflicts between and within ministries or public administration organisations do not stop with the formulation of policies; they also complicate their implementation (Howlett & Ramesh 2003, 187). In the ideal-type policy cycle, monitoring and evaluating policies marks the last stage of policy making, resulting either in the termination or the renewal of a particular policy. Here, policy makers and/or researchers assess the relevance, efficiency and effectiveness of a particular policy (Jann & Wegrich 2003). However, feedback should not be restricted to a single stage but should inform all stages of the policy cycle (Wollmann 2003, 337).

The notion of policy making as a cyclical process with stages is an ideal-typical model. In reality agenda setting, policy formulation and decision-making, implementation, and evaluation are no clear-cut stages but they have multiple interrelations, fuzzy boundaries, and policy makers usually handle different policies at different stages in parallel (Jann & Wegrich 2003, 81). Nevertheless, the policy cycle is a useful heuristic model that helps to better understand and analyse complex policy making processes (Jann & Wegrich 2003). Therefore, and because the policy cycle plays a prominent role in the adaptation literature and in adaptation guidelines, we employ it as an analytical frame that helps to organise the empirical research summarised in the following two sections.

3. Policy-related barriers of adaptation

This section summarises a systematic review of the scientific climate change adaptation literature (i.e. peer reviewed articles, books and book chapters and research reports) of the past ten years. The desk research (conducted between February and April 2011) focused on policy-related barriers that hinder adaptation policy making at various levels of government. Since we were interested in generic barriers of adaptation, we did not include literature concerned with a particular theme or sector of adaptation (such as water management). Although different sources address different barriers, and many of them employ variations of the policy cycle model to organise them (see section 2), we were able to aggregate the numerous barriers from 49 sources into 16 key barriers (for an overview see Annex 1). At least six of the 16 key barriers are cross-cutting not only in the sense that they are relevant for all stages of the policy cycle but also in the sense that they are closely linked with each other. The remaining 10 barriers can be allocated to one of the four policy cycle stages. Although the aggregation of barriers to key barriers and their allocation to policy cycle stages is often a question of interpretation, the collection of barriers described here (and summarized in the tables displayed in annex 1) fulfills its purposes: it provides a solid basis for analyzing respective gaps in adaptation

guidelines. Besides, it can inform policy makers about the key issues to watch out for when developing adaptation policies.

Cross-cutting barriers relevant for all policy cycle stages (C.1-C.6):

C.1 Lack of political commitment: A cross-cutting barrier often mentioned in the adaptation literature is the missing will of policy makers to facilitate adaptation (Smit & Pilifosova 2001). Behind this key barrier stand not only all other cross-cutting barriers described below (C.2-C.6) but also two key barriers that play a particularly important role in the agenda setting stage of policy making, i.e. a lack of awareness for the importance of climate change adaptation (A.1), and the fact that adaptation priorities are often disputed (A.2). The reasons for a lack of political commitment (and for the related barriers) are manifold. Most importantly, societies and policy makers usually focus rather on short-term costs and benefits than on long-term transitions (Berrang-Ford et al. 2011; Burch 2010 292ff; Nilsson & Swartling 2009). Since the long-term benefits of climate change adaptation are often unclear but costs incur in the present, adaptation policies are politically (and economically) difficult to develop, and even more difficult to implement (UKCIP 2007; Smith et al. 2009). Several authors also observe trade-offs between mitigation and adaptation issues at the expense of the latter (Klein 2003; Hirschnitz-Garbers & Stoll-Kleemann 2010; Moser 2009a; Nilsson & Swartling 2009; Preston et al. 2010). The lack of political commitment can also be due to a lack of adequate leadership (Carius 2005; Moser & Ekstrom 2010; Smith et al. 2009). If the responsible policy makers do not have the motivation, the authority, or the skills to lead adaptation policy processes actively, respective policies run the risk of being symbolic and ineffective (Moser 2009a).

C.2 Responsibilities are inadequate or unclear: This barrier is referring to the polity dimension of policy making, i.e. to the institutional setup and the roles and responsibilities assumed by different governmental authorities. Since adaptation is a relatively new and complex policy field that cuts across sectoral competencies and levels of government, respective responsibilities are not always adequate or sufficiently clear. Consequently, adaptation issues have difficulties in entering political agendas and adaptation policies are neither formulated nor implemented (Amundsen et al. 2010; Biesbroek et al. 2010; Burch 2010, 292ff; Swart et al. 2009, 69; Moser 2009a). This applies in particular to local entities. On the one hand, Amundsen et al. (2010, 11) say that a “lack of a clear defined role for municipalities in adaptation policies is a barrier for them in their work on these issues“. On the other hand they observe that smaller suburban areas tend to “allocate responsibility to a higher level of governance” (Amundsen et al. 2010, 12), waiting for others to act instead of taking the initiative by themselves. Sometimes, disputes about responsibilities have to do with budgetary considerations regarding who has to pay for what (Biesbroek et al. 2010, 445; MEDIATION 2010) or who controls the funds (Swart et al. 2009, 68; CEPS 2008, 5).

C.3 Inadequate cooperation: Another key barrier that hinders adaptation policy making at all stages is a lack of cooperation between responsible political actors (see also C.6). Here, political responsibilities are clear but those responsible for adaptation are not interested or have difficulties in establishing cooperation with other actors horizontally in the same government or vertically across levels of government: “the rigidity of administrative and political borders, the stability of departmentalism and the strength of sectoral interests” avert the formulation of horizontally and

vertically integrated policies (Beck et al. 2009, 37; see also Adger et al. 2005; Gingrich et al. 2008; Kuriakose 2009; Storbjörk 2010; Vignola et al. 2009). This lack of cooperation can lead to missed synergies, unresolved trade-offs, duplication of work, and overall ineffective policies (Swart et al. 2009). Although governments have introduced innovative governance approaches addressing horizontal and vertical cooperation in recent years, inadequate cooperation remains a key barrier hindering the exchange of experiences across various levels of government (Nilsson & Swartling 2009, 12; Smit & Pilifosova 2001).

C.4 Not enough resources: Effective adaptation policies usually require both adequate financial and human resources (Burch 2010; Frommer 2009; Smit & Pilifosova 2001; UKCIP 2007). While adequate human resources play a key role in all stages of policy making, financial resources appointed to the responsible institutions (see also C.2) are particularly important in the implementation stage (Carius 2005). As Aaheim and Aasen (2008) point out, even if there is consensus regarding certain adaptation actions, limited budgets often prohibit their realisation (see also Hulme & Dessai 2008; Smit & Pilifosova 2001; UKCIP 2007; Smith et al. 2009). Moser and Ekstrom emphasise that piecemeal approaches are not enough: “more resources just for science but not for implementation or for monitoring does not result in a greater likelihood of adaptation actions being implemented on the ground” (Moser & Ekstrom 2010, 22030). Regarding human resources, quantitative issues such as a lack of staff as well as qualitative issues such as qualifications and expertise (F.1) often make successful adaptation impossible (Burch 2010; Jones 2010; Moser & Ekstrom 2010; Scientific expert group on climate change and sustainable development 2007; UKCIP 2007).

C.5 Lack of evidence or certainty: A considerable lack of evidence or certainty regarding global climate scenarios, regional climate change impacts, and/or the costs and benefits of policy options constrain policy makers in addressing climate change adaptation adequately (Berrang-Ford et al. 2011, 32; Burton et al. 2009; CEPS 2008; Hulme et al. 2007; Roberts et al. 2009; Smit & Pilifosova 2001; Smith et al. 2009; UKCIP 2007). The uncertainties regarding climate change (adaptation) that concern policy makers are often due to scientific or methodological problems in predicting future developments and impacts (Aaheim & Aasen 2008; Füssel 2007; Moser 2009a; Smith et al. 2009; see also E1), and in assessing the consequences of adaptation actions (IPCC 2007, 733). Some scholars also observe a lack of application-oriented scientific results (Biesbroek et al. 2010; Swart et al. 2009) that are difficult to act upon politically, in particular at the local level (Moser 2009a, 33; Vignola et al. 2009).

C.6 Insufficient knowledge-brokerage and networking: The final cross-cutting barrier we identified in the adaptation literature addresses problems related to learning from scientific knowledge or practical experiences. On the one hand, policy learning can be hampered by inadequate brokerage of scientific knowledge. Even if scientific evidence is (relatively) certain, inadequate interfaces between science and policy making can prevent it from being acted upon in the political sphere. Problems frequently referred to in this context are e.g. different rationalities and languages in science and policy-making (Hinkel 2011), and a lack of adequate ‘knowledge brokerage institutions’ that can help to bridge these and other differences. On the other hand, policy learning can also be hindered by a lack of networking and exchange among policy makers. Isolated within their specific national, regional or local context (Nilsson & Swartling 2009, 12), policy makers rarely benefit from the experiences made by others, and they rarely share their own experiences with others (Moser 2009a; Storbjörk 2010) (see also C.3). Because networking opportunities in the relatively new adaptation

policy field are rare, good adaptation practices are not easily replicated and bad practices are not avoided based on the experiences of others (Moser 2009a, 33; Nilsson & Swartling 2009, 12; Smit & Pilifosova 2001).

Agenda setting (A.1-A.2)

Setting climate change adaptation issues on the political agenda is hampered by all cross-cutting barriers listed above¹ because political agendas are always crowded and policy makers tend to focus their awareness on highly relevant, urgent problems that require immediate responses (Carius et al. 2005; Storbjörk 2010). Since adaptation issues rarely match this 'profile of political importance' they often fail to gain political commitment (see barrier C.1) and are therefore often excluded from political agendas. A lack of cooperation (C.3), sufficient evidence and certainty (C.5), and insufficient networking opportunities (C.6) worsen this problem.

A.1 No or too little awareness among policy makers: Adaptation issues have difficulties in entering political agendas because policy makers at various levels are not or too little aware of adaptation needs (Jones 2010; Moser 2009a; Moser & Ekstrom 2010; Smit & Pilifosova 2001; UKCIP 2007). Amundsen argues that a lack of awareness among national policy makers often leads to low levels of awareness at local levels (Amundsen et al. 2010). Increased public pressure would raise the awareness of political actors (Lorenzoni et al. 2007). However, for reasons addressed under barrier C.1 (lack of political commitment) and C.5 (lack of evidence and certainty), adaptation is widely ignored also by the public (Hulme et al. 2007; Lorenzoni et al. 2007). An inadequate, event-based risk perception is widespread (Berrang-Ford et al. 2011, 27; Biesbroek et al. 2010; Ford 2008), and it results in a sense of security that denies any sense of urgency among policy makers and the public alike (Berrang-Ford et al. 2011; Hirschnitz-Garbers & Stoll-Kleemann 2010; Smith et al. 2009; UKCIP 2007).

A.2 Priorities are disputed: Another barrier keeping adaptation from entering political agendas is the difficulty to prioritise certain adaptation needs and policies over others, inter alia because it is difficult to assess the urgency of needs and the effectiveness of policies ex-ante (Burch 2010; Moser & Ekstrom 2010; Smit & Pilifosova 2001). Since adaptation priorities are disputed (inter alia because of trade-offs between mitigation and adaptation issues (see barrier C.1) and a lack of evidence and certainty [C.5]), other, less disputed and more urgent issues crowd political agendas (Lorenzoni et al. 2007, 446; for the local level see Burch 2010, 292).

Policy formulation and decision making (F.1-F.3)

Political commitment (see barrier C.1) and clear responsibilities in climate change adaptation (C.2) are key prerequisites for formulating adaptation policies. If one or both of these prerequisites are missing, they turn into key barriers, i.e. adaptation issues may be discussed in the agenda-setting phase but it is unlikely that respective policies are formulated or adopted later on. Since the formulation of adaptation policies often requires the cooperation with other policy makers (both horizontally from other ministries within the same government and vertically from other levels of

¹ Although this applies to all stages of the policy cycle we focus the introductions on the most eminent cross-cutting barriers.

government; see barrier C.3), this phase of the policy cycle is often problematized by the lack of respective coordination (Bauer et al. 2011; Swart et al. 2009). Moreover, a lack of evidence and certainty (C.5) makes it difficult to assess and prioritise policy options (Carius et al. 2005; Smit & Pilifosova 2001). On top of these cross-cutting barriers, the exploration of various policy options and the formulation of adaptation policies are also hindered by the following three key barriers.

F.1 Lack of expertise among policy makers: The exploration of various policy options usually precedes the formulation of concrete policies. Even if the costs and benefits of various policy options are known and transparent, policy makers at all levels often have difficulties in translating this knowledge into action because the formulation of particular policies is usually more specific than the assessed options (Moser 2009, 33; Burch 2010). Moreover, policy makers at all levels are sometimes confronted with an option and information overload, i.e. with too many options that are too complex for them to understand (Moser 2009, 33; Burch 2010). Smith et al. (2009, 55ff) emphasise that in particular smaller political entities at the local level are either unfamiliar with scientific data in general (if they have access to this data at all) or have difficulties in applying study results to their local context (see also Amundsen et al. 2010).

F.2 Conflicting values and interests: Although political resistance based on conflicting values and interests is a key barrier prevalent in the entire policy cycle, it is particularly relevant in the formulation phase when the details of the policy options (in particular their advantages and disadvantages) are known. At this stage, the fact that different political actors adhere to different ideologies and values and therefore pursue different interests (often implicitly) can impede their efforts to reach a consensus on adaptation goals and measures (Adger et al. 2008; Gingrich et al. 2008; Nilsson & Swartling 2009; Roberts et al. 2009). The same applies to the interpretation of expected policy outcomes: while some policy-makers may regard a particular outcome as desirable, others may view it more critical (Fritze et al. 2009; Klein 2003; Roberts et al. 2009; Smit & Pilifosova 2001, 889).

F.3 Available options are unsatisfactory for policy makers: While the formulation of adaptation policies is difficult but possible under the circumstances described above, it is highly unlikely when policy makers believe that the available adaptation options are unsatisfactory in the sense that they do not meet their expectations or needs. This barrier may be due to a lack of awareness for adaptation issues (see key barrier A.1), an incomplete picture of the options available (Smit & Pilifosova 2001; UKCIP 2007), a lack of applied (or 'use-inspired') research and respective knowledge (Füssel 2007; Smith et al. 2009), and a lack of "no-regret policies", i.e. options that make good political and economic sense under any climatic circumstances (Smit & Pilifosova 2001; Smith et al. 2009; UKCIP 2007).

Policy implementation (I.1-I.3)

In the policy implementation stage, a lack of political commitment (see barrier C.1), inadequate or unclear responsibilities (C.2), and a lack of resources (C.4) may all result in a gap between intentions and realisation efforts, producing merely symbolic policies (i.e. policies that have been formulated and adopted but that are not implemented adequately; see Newig 2007). However, even if these and other (cross-cutting) barriers can be avoided or overcome, an adequate implementation of

adaptation policies is not secured because of at least three additional barriers that emerge at the latest at this stage of policy making.

1.1 Adaptation policy is politically/administratively infeasible: If policies have a symbolic purpose, or when they are unrealistic, too ambitious or not specific enough, their implementation will fail (Berrang-Ford et al. 2011; Füssel 2007). The implementation of adaptation policies can also fail when unforeseen developments occur, e.g. when those addressed by a particular policy behave differently than expected. According to Nilsson and Swartling (2009), this implementation failure may be prevented by a close cooperation with (local) practitioners (see also IPCC 2007).

1.2 No adequate technological solution available: Another prerequisite for the successful implementation of some adaptation policies is the availability of adequate technological solutions (Berrang-Ford et al. 2011; Burch 2010; Smit & Pilifosova 2001). If technological solutions are inadequate, not affordable, or if access to adequate technologies is restricted, an adopted adaptation goal may never be implemented and will become symbolic (Burch 2010; Hulme et al. 2007; Jones 2010; Keskitalo 2010a; UKCIP 2007).

1.3 Legal issues: The legal framework may also pose a serious barrier to the implementation of adaptation policies (Hirschnitz-Garbers & Stoll-Kleemann 2010; Howlett & Ramesh 2003, 187; Nilsson & Swartling 2009). Existing regulations may restrict the implementation of adaptation policies (Aaheim & Aasen 2008; Moser 2009a, 2010; UKCIP 2007), or they may simply be not supportive (Burch 2010).

Policy monitoring and evaluation (E.1-E.2)

When political commitment is weak or lacking (see barrier C.1), policy makers are usually not interested in a critical evaluation of implemented policies. But, even if this prerequisite is met, monitoring and evaluating adaptation policies can be difficult when financial resources are scarce (C.4), when evidence regarding climate change is disputed or when the interfaces between science and policy making are weak or non-existent (C.5). Moreover, policy learning can also be hindered by two additional barriers that emerge at this late stage in the policy cycle.

E.1 Complexity of policy impacts and outcomes: Adaptation policies are often hard to assess, in particular when their impacts and outcomes materialise in the long rather than in the short term (Berrang-Ford et al. 2011; Carius et al. 2005). Policy learning is also hindered by the fact that policy makers as well as evaluators tend to ignore effects that were not intended by the implemented measures but jeopardize their outcomes (Perez & Yohe 2005, 213; Smit & Pilifosova 2001, 893). Additionally, while context factors and policies may change constantly, monitoring and evaluation efforts are often too inflexible (Perez & Yohe 2005). If the applied instruments are not able to take (unforeseen) changes into account throughout the policy process, the feedback they provide is not adequate for policy makers (Burton et al. 2009).

E.2 Lack of experience with monitoring and evaluation practices in the context of adaptation: While evaluation and monitoring practices have been established in other policy fields such as climate change mitigation (Huitema et al. 2011) or sustainable development (Steurer & Hametner, forthcoming), resorting to established indicator sets, evaluation procedures or criteria in the context

of adaptation is usually impossible (EEA 2009; Perez & Yohe 2005; Swart et al. 2009, 98; Perez & Yohe 2005). As a consequence, respective practices often lack a clear understanding of what should be monitored or evaluated (Perez & Yohe 2005), what procedures to collect and process data should be used (Perez & Yohe 2005), and how to share and accumulate data. All this can hinder adaptation because policy makers do not obtain adequate feedback that signals the need to act.

Obviously, the adaptation literature identifies numerous barriers that potentially hinder adaptation at various stages of policy making. While all barriers apply to all levels of government, some of them seem to be more pronounced at the local level (see e.g. the barriers C.5, A.1 and F.1). Of course, the collection of barriers described above is a snapshot in time, and it is likely to change when the still young policy field matures. We now turn to guidelines as potentially useful means to circumvent or overcome these (and other) barriers.

4. Guidelines on adaptation policy making

The barriers described above can determine the success or failure of adaptation policies. Since guidelines aim to support policy makers in developing and implementing adaptation policies, most of the guidelines we analysed explicitly acknowledge the need to address barriers (often also referred to as challenges, obstacles, constraints or limitations). To identify guidelines for adaptation policy making, we have performed an internet keyword search by using terms such as “guid*” (e.g. guidelines, guidebooks, guidance), “framework”, “approach”, “method*” and “tool/toolkits”) in connection with climate change adaptation. We have identified 33 guidelines for adaptation to climate change in English (see Annex 2). They can be characterised as follows:

The oldest guideline was published by the IPCC in 1994. Together with a guideline published by the UNDP in 1998, it represents the 1st generation of adaptation guides that focused on climate change impacts (Burton et al., 2002). The remaining 31 documents have been published between 2003 and 2011 (approximately one third of them in 2009, the year of the Conference of the Parties/COP in Copenhagen), and they all offer support in the design of adaptation strategies, action plans or adaptation programs. Seven of the 33 guidelines address the issue of adaptation in developing countries while 26 focus on adaptation in OECD countries. Within the OECD countries, most work on guidelines was done in the UK. International organisations such as the United Nations Development Programme (UNDP) and the World Health Organisation (WHO), or national institutions working on international issues (like the United States Agency for International Development), have published 18 of the 33 guidelines. On the European level, two guidelines have been developed by the Commission, one by the European Centre for Disease Prevention and Control (ECDC), and three within research projects financed by the EU. Nine guidelines have been developed by national ministries.

Thirteen of the 33 guidelines were written by researchers and four by consultants, in each case in close cooperation with a core team from the public agency that commissioned and published them. More than half of these guidelines included comments and inputs from external reviewers and practitioners. Six guidelines were developed by research institutes or consultants without external feedback from practitioners, and the remaining five guidelines were prepared by experts from the public agencies that also published them.

When looking at the thematic focus of the guidelines, we have identified 21 guidelines which do not address a specific adaptation theme and 12 that focus on a particular sector such as water or health. All guidelines primarily aim to support policy makers, but some of them also target NGOs and businesses. Approximately one third of the guidelines explicitly address more than one level of decision making (e.g. national and regional or regional and local levels), while eight focus explicitly on the local, four on the regional and only three on the national level. Seven guidelines do not define a specific level of decision making.

The key purposes of the 33 guidelines can be summarised as follows (most of them addressing more than one purpose):

- give practical policy guidance on adaptation to climate change (16 mentions)
- introduce a wide range of methods that can be used for adaptation planning and policy (7 mentions)
- raise awareness for the need of adaptation and respective policy options (6 mentions)
- assist in the process of mainstreaming adaptation concerns in various policy fields (4 mentions)
- enhance the capacity of adaptation planners and policy makers (3 mentions)
- reduce vulnerability to climate variability and change (3 mentions)
- provide guidance on the linkages between climate change adaptation and mitigation (2 mentions).

Most guidelines are comprehensive and prescriptive documents, i.e. they give a clear direction on how adaptation should be pursued. They disaggregate complex policy making processes either by employing some kind of policy cycle (22 guidelines), or by following guiding questions (11 guidelines). They provide support by means of checklists, decision trees or a compilation of assessment, prioritisation and stakeholder involvement methods. Some guidelines even suggest a list of concrete adaptation measures to be implemented at different levels of government and/or in different sectors.

While guidelines can be helpful tools in identifying and addressing the barriers described in section 3, they nevertheless face limitations. On the one hand, guidelines can be seen as “ideal world scenarios” or as “maximum approaches” with only a small chance to be put into practice. On the other hand, Burton et al. (2002) underline that prescriptive guidelines do not allow the kind of creativity and ingenuity that is required for effective adaptation. Another potential limitation that has not been analysed so far comes into play when guidelines reflect mainly the (subjective) experiences of their authors but fail to take the research on barriers in adaptation policy making into account. We now analyse in how far this potential limitation applies to the 33 guidelines that have been introduced here by comparing them with the barriers described in section 3.

5. How guidelines address barriers

To assess in how far the adaptation guidelines address the barriers identified in the adaptation literature (see section 3), we conducted a systematic review of the guidelines introduced above in

two steps. In a first step, we searched for the terms barrier, obstacle, challenge, limit and constraint in all 33 guidelines and we allocated the barriers we found via keyword search to the list of barriers presented in section 3. In a second step, we analysed 12 of the 33 guidelines in more detail to find out in how far they address barriers in adaptation policy making not only explicitly but also implicitly (i.e. without speaking of barriers). The 12 guidelines we selected belong to 2nd generation (Burton et al. 2002), focus on developed countries and have no sectoral focus (for details on the selected guidelines, see Annex 3). The contents of the 12 guidelines were analysed qualitatively, i.e. the barriers identified in section 3 served as coding categories and we assigned sections of the guidelines to the appropriate “codes” in an excel sheet. Barriers which are mentioned by the guidelines but not in the adaptation literature were collected separately.

The first step of analysis showed that 27 of the 33 guidelines explicitly refer to 14 of the 16 barriers identified in section 3 (see table 1). While work done by Lim et al. (2004), Snover et al. (2007), Ribeiro et al. (2009), Grabs project (2009) and UNDP (2010) mention nearly half of these 14 barriers, 14 guidelines only refer to a maximum of three barriers identified in section 3 (e.g. ICLEI Oceania 2008, Bizikova et al. 2008, Nordregio 2009, Daze et al. 2009). The three barriers that are mentioned most often in the guidelines are a “lack of evidence or certainty” (C.5), followed by a “lack of resources” (C.4) and “unclear responsibilities within & between levels of government” (C.2). Not explicitly addressed are the barriers “policy is politically/administrative infeasible” (I.1) and a “lack of experience with monitoring and evaluation practices” (E.2).

On the one hand, this finding confirms that most of the barriers identified in section 3 are practically relevant in the context of adaptation as they play a certain role in existing guidelines. On the other hand, the results also show at a glance that guidelines do not address all barriers systematically.

Table 1: Number of guidelines which explicitly refer to barriers identified in section 3 (n=33)

Barriers	# of mentions in guidelines
Lack of evidence or certainty (C.5)	17
Lack of resources (C.4)	13
Legal issues (I.3)	12
Unclear responsibilities within & between levels of government (C.2)	9
Conflicting values and interests (F.2)	9
Insufficient knowledge-brokerage and networking (C.6)	5
Inadequate cooperation (C.3)	5
No or too little awareness among policy makers (A.1)	5
Priorities are disputed (A.2)	5
Imperfect expertise (F.1)	5
Lack of political commitment (C.1)	4
No adequate technological solutions (I.2)	3
Available options are unsatisfactory (F.3)	2
Complexity of policy impacts and outcomes (E.1)	1
Lack of experience with monitoring and evaluation practices (E.2)	0
Policy is politically/administrative infeasible (I.1)	0

16 of the 33 guidelines give general recommendations without addressing particular barriers. The following recommendations are most frequent:

- engage stakeholders and establish partnerships (9 mentions),
- compile and disseminate information (7 mentions),
- apply and include multi-disciplinary tools and expertise (6 mentions),
- secure funding early in the process (5 mentions),
- develop flexible and supportive legislations and institutions (5 mentions).
- enhance communication (5 mentions),
- establish a matrix that identifies barriers and options to overcome them (4 mentions), and
- develop flexible and adaptive processes and structures (2 mentions).

How do the 12 selected guidelines address barriers of adaptation explicitly or implicitly and what support do they offer to overcome them? The remainder of this section focuses on the barriers described in section 3 (for further details and references, see Annex 3). Section 6 then highlights gaps between the barriers addressed in the adaptation literature and the guidelines.

Cross-cutting barriers relevant for all policy cycle stages (C.1-C.6):

Only one of the 12 guidelines explicitly emphasises that political commitment from senior policy makers (C.1) is vital for successful adaptation processes. Nevertheless, three guidelines provide general suggestions on how to overcome this barrier (e.g. by identifying the reasons for a lack of commitment or by involving key decision makers from the start). One guideline suggests a briefing paper that explains the needs, costs and benefits of adaptation.

Although unclear responsibilities within and between levels of government (C.2) have been identified as a barrier in four of the 12 guidelines, we found not a single recommendation on how to overcome it. This might be because most of the guidelines target specific groups which are already engaged in adaptation processes. Thus, most guidelines go one step further and describe how the institutional setup should ideally look like. This leads us to the next barrier. Most of the 12 guidelines provide concrete methods and tools for establishing adequate cooperation (C.3), e.g. by establishing a core team for adaptation and developing adaptation partnerships. Awareness raising (e.g. through information in newsletters, briefings, workshops) is seen as an important prerequisite for appropriate cooperation.

A lack of resources (C.4) is one of the key barriers mentioned in half of the 12 guidelines assessed in detail, and six of them provide suggestions on how to overcome it. Among others, they propose to conduct preliminary assessments to estimate the required resources at an early stage, or they recommend mainstreaming approaches that aim to create synergies and prevent unnecessary costs.

A lack of evidence or certainty (C.5) is another key barrier touched on in almost all guidelines. Ten guidelines suggest vulnerability/risk assessments, five guidelines highlight the principles of adaptive management, and a few guidelines suggest approaches for communicating uncertainties. In contrast, only two of the 12 guidelines propose how to tackle insufficient knowledge-brokerage and networking (C.6). While some suggestions are rather concrete (e.g. to use the EU Platform on Climate

Change Adaptation as valued information source), others stay at a very generic level (e.g. to apply tools to capture lessons learned).

Agenda setting (A.1-A.2)

While only two of the 12 guidelines explicitly emphasise that little awareness among policy makers is a barrier for adaptation (A.1), most of them provide some suggestions on how to overcome it. They suggest websites and other information sources, press statements and public meetings, etc. In addition, a number of guidelines present case studies that aim to illustrate the range of adaptation possibilities and enhance motivation. Only one guideline emphasises that awareness alone does not necessarily lead to action. While disputed priorities (A.2) are mentioned as barrier in three of the 12 guidelines, only one guideline makes a suggestion on how to overcome tensions between adaptation and mitigation.

Policy formulation and decision making (F.1-F.3)

Half of the guidelines provide a number of tools that address a lack of adaptation expertise among policy makers (F.1). Among the tools are checklists, guiding questions, questionnaires and templates (e.g. for assessing the impacts of future climate change, or for working with affected actors). Even though conflicting values and interests (F.2) are explicitly addressed in five of the 12 guidelines, only three guidelines provide four different suggestions (i.e. assessing the impact and feasibility of adaptation options, involving other political actors). In comparison, unsatisfactory options (F.3) are explicitly mentioned only in two guidelines, but half of the guidelines implicitly address this barrier by providing lists of concrete adaptation options as well as various appraisal approaches. Although this barrier is highly context-specific (e.g. in regional or sectoral terms), the suggestions in the guidelines are very general and may at best help to increase the users' imagination and motivation on how adaptation can look like.

Policy implementation (I.1-I.3)

The first two barriers allocated to this stage of the policy cycle - i.e. policies are politically or administratively infeasible (I.1) and technological solutions are inadequate (I.2) - were neither mentioned in the guidelines, nor did we identify tools that help to overcome them. Although legal issues (I.3) are noted as a barrier in four guidelines, information on how to overcome it is limited. Interestingly, five guidelines provide the same suggestion, i.e. to create a legal environment that facilitates adaptation, e.g. by modifying existing laws, practices and procedures.

Policy monitoring and evaluation (E.1-E.2)

Although only one guideline explicitly mentions the complexity of policy impacts and outcomes (E.1), a couple of documents suggest setting clear policy objectives that also help to monitor policies. Likewise, although a lack of experience with monitoring and evaluation practices (E.2) is not explicitly mentioned in the guidelines, several of them suggests to measure progress with indicators and to involve stakeholders. However, since the lack of monitoring experience is a problem not only policy makers but also researchers and consultants seem to struggle with, we did not find concrete support on how to overcome this final barrier of adaptation policy making.

6. Conclusion

If we compare the barriers described in section 3 and the guidelines analysed in sections 4 and 5, the following three conclusions emerge: First, although guidelines are supposed to help overcoming difficulties in adaptation policy making, they are rarely based on a systematic analysis of barriers, be it in the form of a literature review (as conducted in section 3) or in the form of own empirical studies. Most guidelines do not even address the evidence base they build upon (e.g. research, expert suggestions or subjective experiences), and they do not provide background information on why certain barriers have been addressed and others not. As a sobering result, few of the barriers identified in section 3 are systematically addressed in the guidelines. In fact, only one of the barriers mentioned frequently in the guidelines – i.e. “lack of evidence and certainty” – is addressed with a high number of advices. The reliability and usefulness of the guidelines is also questionable because most of them have not been practically tested or evaluated so far, and because their structure and contents are often very similar, although some of them address certain sectors or particular levels of government.

Second, the linkages between the barriers explicitly addressed in the guidelines and the recommendations provided are unsystematic. Sometimes, barriers are explicitly mentioned but no tools are provided to tackle them (e.g. “lack of resources”, “legal issues”, “unclear responsibilities within & between levels of government”, “conflicting values and interests”), and sometimes tools obviously address barriers that have not been explicitly recognised as such. Many suggestions are e.g. presented on how to overcome “inadequate cooperation” although this barrier is alluded as such in only a few guidelines. Likewise, only a few guidelines explicitly mention the barrier “no or too little awareness among policy makers”, whereas most of them provide suggestions on how to raise awareness. Interestingly, we found no indication in the guidelines suggesting that the list of barriers identified in section 3 was incomplete.

Third, barriers that are highly context-specific and/or difficult to overcome are often addressed with general suggestions that may not offer much help for policy-makers. Regarding legal barriers, e.g., several guidelines suggest to mainstream adaptation into existing policies, but how this can be achieved usually remains open. Regarding conflicting values and interests, a couple of generic approaches are suggested that are unlikely to resolve political conflicts.

To conclude, the analysed guidelines do not place barriers at the centre of their attention when providing tools and methods for adaptation policy making. Although most of the guidelines (27 out of 33) explicitly mention certain barriers of adaptation policy making, they do not systematically provide tailor-made tools or practical advice on how to overcome them. Instead, they present methods and tools broadly understood as “good practice in adaptation”.

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ANNEX 1: Barriers in adaptation policy making

Cross-cutting barriers

C	Key barriers & related issues	Sources (in alphabetical order)
C.1	<p>Lack of political commitment</p> <ul style="list-style-type: none"> • Political will too weak or inexistent • Leadership inadequate 	<p>Berrang-Ford et al. 2011; Burch 2010; Carius et al. 2005; Hirschnitz-Garbers/Stoll-Kleemann 2010; Klein 2003; Lorenzoni et al. 2007; Moser 2009a; Moser/Ekstrom 2010; Nilsson/Swartling 2009; Preston et al. 2010; Smit/Pilifosova 2001; Smith et al. 2009; Storbjörk 2010; UKCIP 2007</p> <p>Burch 2010; Carius et al. 2005; Moser 2009a; Moser/Ekstrom 2010; Smith et al. 2009</p>
C.2	<p>Responsibilities are inadequate or unclear (including financial responsibilities)</p>	<p>Amundsen et al. 2010; Biesbroek et al. 2010; Burch 2010; CEPS 2008; Kivimaa/Mickwitz 2009; MEDIATION 2010; Swart et al. 2009</p>
C.3	<p>Inadequate cooperation</p> <ul style="list-style-type: none"> • Inadequate (institutional arrangements for) horizontal and vertical cooperation 	<p>Nilsson/Swartling 2009; Smit/Pilifosova 2001; Swart et al. 2009; Kivimaa/Mickwitz 2009</p> <p>Adger et al. 2005; Bauer et al. 2011; Beck et al. 2009; Centre for European policy study 2008; Gingrich et al. 2008; Kuriakose 2009; Storbjörk 2010; Vignola et al. 2009</p>
C.4	<p>Not enough resources</p> <ul style="list-style-type: none"> • Lack of financial resources • Lack of human resources 	<p>Aaheim/Aasen 2008; Hulme/Dessai 2008; Kivimaa/Mickwitz 2009; Moser 2009a; Moser/Ekstrom 2010; Smit/Pilifosova 2001; Smith et al. 2009; Swart et al. 2009; UKCIP 2007</p> <p>Burch 2010; Jones 2010; Moser/Ekstrom 2010; Scientific expert group on climate change and sustainable development 2007; UKCIP 2007</p>
C.5	<p>Lack of evidence or certainty</p>	<p>Aaheim/Aasen 2008; CEPS 2008; Hulme et al. 2007; Moser 2009a; Roberts et al. 2009; Schipper/Burton 2009; Smit/Pilifosova 2001; Smith et al. 2009; UKCIP 2007; Lorenzoni et al. 2007; Swart et al. 2009</p>
C.6	<p>Insufficient knowledge-brokerage and networking</p> <ul style="list-style-type: none"> • Insufficient communication of scientific findings to policy makers 	<p>ADAM; Berrang-Ford et al. 2011; Hinkel 2011; IPCC 2007; Moser 2009a; Perez/Yohe 2005; Swart et al. 2009; UKCIP 2007; Vignola et al. 2009</p>

	<ul style="list-style-type: none"> Insufficient networking and exchange among policy makers 	Moser 2009a; Fritze et al. 2009; Nilsson/Swartling 2009; Smit/Pilifosova 2001; Storbjörk 2010
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Agenda setting

A	Key barriers & related issues	Sources (in alphabetical order)
A.1	No or too little awareness among policy makers <ul style="list-style-type: none"> No public pressure/public engagement No or too little learning from (others') experiences Problem recognition depends on events 	Amundsen et al. 2010; Carius et al. 2005; Jones 2010; Moser 2009a, 2010; UKCIP 2007; Smit/Pilifosova 2001 Berrang-Ford et al. 2011; Hirschnitz-Garbers/Stoll-Kleemann 2010; Hulme et al. 2007; Jones 2010; Lorenzoni et al. 2007; Moser 2009a, 2010; Smith et al. 2009; UKCIP 2007 Burch 2010; Storbjörk 2010 Berrang-Ford et al. 2011; Biesbroek et al. 2010; Carius et al. 2005; Ford 2008; Storbjörk 2010
A.2	Priorities are disputed	Burch 2010; Moser/Ekstrom 2010; Smit/Pilifosova 2001

Policy formulation and decision making

F	Key barriers & related issues	Sources (in alphabetical order)
F.1	Lack of expertise among policy makers	Amundsen et al. 2010; Burch 2010; Moer 2009; Smith et al. 2009
F.2	Conflicting values and interests: <ul style="list-style-type: none"> Expected policy outcome(s) 	Adger et al. 2005; Gingrich et al. 2008; Nilsson/Swartling 2009 Roberts et al. 2009; Smit/Pilifosova 2001 Fritze et al. 2009; Klein 2003; Roberts et al. 2009; Smit/Pilifosova 2001
F.3	Available options are unsatisfactory for policy makers <ul style="list-style-type: none"> Knowledge and information about options not sufficient "No-regret"-options are missing 	Füssel 2007; Smit/Pilifosova 2001; Smith et al. 2009; UKCIP 2007 Smit/Pilifosova 2001; Smith et al. 2009; UKCIP 2007

Policy implementation

I	Key barriers & related issues	Sources (in alphabetical order)
I.1	Adaptation policy is politically/administratively infeasible	

	<ul style="list-style-type: none"> • Original policy unrealistic • Unforeseen changes or new conditions • Co-operation with practitioners too little too late 	<p>Berrang-Ford et al. 2011; Füssel 2007</p> <p>Berrang-Ford et al. 2011; Howlett/Ramesh 2003</p> <p>IPCC 2007; Nilsson/Swartling 2009;</p>
I.2	No adequate technological solution available	Berrang-Ford et al. 2011; Burch 2010; Hulme et al. 2007; Jones 2010; Keskitalo 2010a; Smit/Pilifosova 2001; UKCIP 2007
I.3	<p>Legal issues</p> <ul style="list-style-type: none"> • Legal Restrictions • Legal framework is not enabling/supporting 	<p>Aaheim/Aasen 2008; Moser 2009a, 2010; UKCIP 2007</p> <p>Burch 2010; Hirschnitz-Garbers/Stoll-Kleemann 2010; Howlett/Ramesh 2003; Nilsson-Swartling 2009</p>

Policy monitoring and evaluation

E	Key barriers & related issues	Sources (in alphabetical order)
E.1	<p>Complexity of policy impacts and outcomes</p> <ul style="list-style-type: none"> • Long-term effects are hard to assess • Unintended effects are ignored • Monitoring instruments are inflexible 	<p>Berrang-Ford et al. 2011; Carius et al. 2005</p> <p>Adger et al. 2005; Perez/Yohe 2005; Smit/Pilifosova 2001</p> <p>Perez/Yohe 2005; Burton et al. 2009; Smit/Pilifosova 2001</p>
E.2	<p>Lack of experience with monitoring and evaluation practices in the context of adaptation</p> <ul style="list-style-type: none"> • Lack of monitoring and reporting routines • Poor structuring of evaluation processes 	<p>EEA 2009; Hulme/Dessai 2008; Perez/Yohe 2005</p> <p>Hulme/Dessai 2008; Perez/Yohe 2005; Smit/Pilifosova 2001; Swart et al. 2009</p> <p>ADAM; Perez/Yohe 2005</p>

ANNEX 2: Overview of guidelines identified; guidelines in bold have been analysed in detail

Titel	Year	Author	Publisher	Level	Sector
IPCC technical guidelines for assessing climate change impacts and adaptations	1994	Carter, T., Parry, M., Harasawa, H. & S. Nishioka	Intergovernmental Panel on Climate Change (IPCC)	Not defined	No specific sector
Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies	1998	Feenstra, J.F., Burton, I., Smith, J.B. & R.S.J. Tol (Eds.)	United Nations Development Programme (UNDP)	Not defined	No specific sector
Climate adaptation. Risk, uncertainty and decision-making	2003	Willows, R. & R. Connell	UK Climate Impacts Programme	Not defined	No specific sector
Methods of assessing human health vulnerability and public health adaptation to climate change	2003	Kovats, S., Ebi, K.L. & B. Menne	World Health Organization (WHO)	Multi-level	Health
Adaptation Policy Frameworks for Climate Change	2004	Lim B. & E. Spanger-Siegfried (Eds.)	United Nations Development Programme (UNDP)	Multi-scale	No specific sector
Guidance Document on Incorporating Climate Change into Community Planning. Walpole Island First Nation Heritage Centre	2004	Conway, T.	Natural Resources Canada	Regional level	No specific sector
Adapting to climate change impacts - a good practice guide for sustainable communities	2006	Land Use Consultants in association with Oxford Brookers University, CAG Consultants and Gardiner & Theobald	Department for Environment, Food and Rural Affairs (DEFRA) and three Regions Climate Change Group	Local level	Build environment
Adapting to climate variability and change. A guidance manual for development planning	2007	Anderson, G. (Eds.)	United States Agency for International Development (USAID)	Not defined	No specific sector
Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments	2007	Snover, A.K., L. Whitely Binder, J. Lopez, E. Willmott, J. Kay, Howell D. & J. Simmonds	The Climate Impacts Group, King County, Washington, ICLEI	Multi-level	No specific sector

Titel	Year	Author	Publisher	Level	Sector
Developing Policies and Adaptation Strategies to Climate Change in the Baltic Sea Region.	2007	Hilpert, K., Mannke, F. & P. Schmidt-Thomé	Developing Policies & Adaptation Strategies to Climate Change in the Baltic Sea Region Project (ASTRA)	Regional level	No specific sector
Local government climate change adaptation toolkit	2008	ICLEI Oceania	Local Governments for Sustainability Oceania (ICLEI)	Local level	No specific sector
Strategic Environmental Assessment and Adaptation to Climate Change	2008	Riss, N. & N. Brooks	Organisation for Economic Co-operation and Development (OECD)	National level	SEA
Climate change. Adaptation and mitigation in development programs	2008	Mani, M., Markandya, A. & V. Ipe	World Bank	Not defined	No specific sector
Climate change adaptation action plan guidance	2008?	grabs project	grabs project	Multi-level	No specific sector
Canadian communities guidebook for adaptation to climate change	2008	Bizikova, L., Neale, T. & I. Burton	Environment Canada's Adaptation and Impacts Research Division	Local level	No specific sector
Chicago Area Climate Change Quick Guide: Adapting to the Physical Impacts of Climate Change	2008	Parzen, J. (Eds)	Chicago Climate Task Force	Local level	No specific sector
Preparing for Climate Change. A guide for local government in New Zealand	2008	Mullan, B., Wratt, D., Dean, S., Hollis, M., Allan, S., Williams, T., & G. Kenny	Ministry for the Environment New Zealand	Local level	No specific sector
Climate Change Impacts and Spatial Planning. Decision Support Guidance	2008	Espace	Espace	Multi- level	Spatial planning
Climate Change Information for Effective Adaptation. A practitioner`s Manual	2009	Kropp, J. & M. Scholze	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in cooperation with Potsdam Institute for Climate Impact Research (PIK)	Local level	No specific sector

Titel	Year	Author	Publisher	Level	Sector
Climate Vulnerability and Capacity Analysis. Handbook	2009	Daze, A., Amrose, K. & C. Ehrhart	Cooperative for Assistance and Relief Everywhere (CARE)	Local level	No specific sector
Design of guidelines for the elaboration of regional climate change adaptation strategies	2009	Ribeiro, M.M., Losenno, C., Dworak, T., Massey, E. Swart, R., Benzie, M. & C. Laaser	European Commission (EC)	Regional level	No specific sector
Guidance on water and adaptation to climate change	2009	UNECE Water	United Nations Economic Commission for Europe (UNECE)	Multi- level	Water
River basin management in a changing climate – a Guidance Document	2009	EC	European Commission (EC)	National level	Water
Climate Change Emergencies and European Municipalities: Guidelines for Adaptation and Response	2009	Langlais, R. (Eds.)	Nordic Center for Spatial Development (NordRegio)	Local level	No specific sector
Shaping climate-resilient development: a framework for decision-making	2009	ECA	Economics of Climate Adaptation (ECA)	Multi-level	No specific sector
Conservation Action Planning Guidelines for Developing Strategies in the Face of Climate Change	2009	Nature Conservancy's Central Science Division	Nature Conservancy's Central Science Division	Multi-level	Nature conservation
Integrating climate change adaptation into development co-operation. Policy Guidance	2009	OECD	OECD's Environment Policy Committee (EPOC) and Development Assistance Committee (DAC)	Multi- level	No specific sector
Designing climate change adaptation initiatives	2010	Lafontaine, A., Vergara, C & G. Quesne	United Nations Development Programme (UNDP)	Multi- level	No specific sector
Climate change and communicable diseases in the EU Member States. Handbook for national vulnerability, impact and adaptation assessments	2010	Lingren E. & K. L. Ebi	European Centre for Disease Prevention and Control (ECDC)	National level	Health

Titel	Year	Author	Publisher	Level	Sector
Climate Change Emergencies and European Municipalities. Guidelines for Adaptation and Response	2010	Sinisi, L. & R. Aertgeerts	World Health Organization (WHO)	Regional level	Health
Climate Change in Water Management	2010	Ludwig, F. & R. Swart	National Research Programme Knowledge for Climate	Not defined	Water
Handbook on Climate Change Adaptation in the Water Sector. A Resilient Approach that Integrates Water Management and Community Development	2010	Japan International Cooperation Agency	Japan International Cooperation Agency	Not defined	Water
Managing adaptation: linking theory and practice	2011	Brown, A., Gawith, M., Lonsdale, K. & P. Pringle	UK Climate Impacts Programme (UKCIP)	Multi-level	No specific sector

ANNEX 3: How guidelines suggest overcoming barriers in adaptation policy making

Cross cutting barriers	
Key barriers and related issues	Suggestions on how to overcome barriers
Lack of political commitment	<ul style="list-style-type: none"> - involving key decision-makers from the start ^(5, 9) - identifying the reasons why there is a lack of commitment to be able to develop more support incrementally ⁽²⁾ - providing briefings on the need for adaptation and making a business case for adaptation ⁽⁹⁾ - holding meetings with decision makers ⁽⁹⁾
Responsibilities within or between levels of government are unclear	
Inadequate cooperation	<ul style="list-style-type: none"> - appointing an individual or team for leading the adaptation process ^(2, 4, 5, 6, 9) - developing communications (e.g. announcements in newsletters, information briefs, workshops) to inform other departments ^(4, 8, 12) - applying mapping techniques for stakeholder analyses ^(4, 6, 9) - establishing climate change adaptation partnerships ^(4, 9) - fostering early involvement ^(7, 9) - encouraging learning processes ^(3, 12) - using existing cross-sector cooperation to mainstream adaptation ⁽³⁾ - developing a common knowledge base ⁽⁷⁾
Not enough resources	<ul style="list-style-type: none"> - using screenings and tiered approaches which help to prevent unnecessary costs ⁽¹⁾ - conducting preliminary assessments as a basis for assessing the costs and benefits ⁽¹⁾ - carrying out an initial assessment of the likely resources required to deliver the adaptation policy at an early stage ⁽⁹⁾ - using synergies by means of integrating adaptation into existing work plans and reviewing the need for additional resources later ⁽²⁾ - establishing long term funding structures for adaptation ⁽⁹⁾ - regularly check if the budget for current and forthcoming years enable adaptation actions to be implemented ⁽⁶⁾ - encouraging sufficient funding from international community ⁽¹¹⁾

Lack of evidence and certainty	<ul style="list-style-type: none"> - suggesting different approaches for risk assessment/vulnerability assessment which accommodate uncertainties ^(1, 2, 4, 6, 7, 8, 9, 11, 12) - following approaches of adaptive management ^(1, 2, 4, 7, 12) - communicating uncertainties and providing approach for communication on uncertainties ^(1, 9, 12) - acknowledging that the information gathered is not wholly objective and that assumptions are made based on e.g. value judgment, political views, etc. ⁽¹²⁾ - working with stakeholders ⁽⁹⁾ - establishing an evidence base based on sound science and best practice examples ⁽⁹⁾ - applying a precautionary approach ⁽⁸⁾ - developing scenarios to guide decisions under uncertainties ⁽¹¹⁾
Insufficient knowledge-brokerage and networking	<ul style="list-style-type: none"> - using the EU Platform on Climate Change Adaptation for exchange (expected to be operative in March 2012) ⁽⁹⁾ - establishing learning networks whose members agree to collect, share and analyse information and exchange experiences ⁽⁴⁾ - applying tools to capture valuable lessons, strategies and assumptions and make it easily accessible to all affected stakeholders ⁽⁴⁾ - fostering collaborative work between governments and researchers ⁽⁴⁾
Agenda setting	
Key barriers and related issues	Information provided in guidelines on how to overcome these barriers
No or too little awareness among policy makers	<ul style="list-style-type: none"> - suggesting different approaches for awareness raising ^(2, 5, 7, 10, 12) - providing a list of potential sources of information ^(1, 4, 6, 9, 10) - presenting case studies to show the range of possibilities in adaptation ^(1, 2, 6, 11) - creating a glossary to foster a common language ^(1, 6, 9) - focussing on the communication and education in adaptation and present does and don'ts ^(2, 3) - applying methods to address the "adaptation bottleneck" where high awareness does not lead to action ⁽¹²⁾
Priorities are disputed	<ul style="list-style-type: none"> - developing a portfolio of adaptation and mitigation responses and identify synergies ⁽⁶⁾

Policy formulation and decision making	
Key barriers and related issues	Information provided in guidelines on how to overcome these barriers
Imperfect expertise among policy makers	- presenting a wide variety of tools and techniques for certain steps in the adaptation process, varying from simple to sophisticated and from generic to specific ^(1, 2, 4, 6, 9, 10)
Conflicting values and interests	- involving stakeholders at an early stage and fostering clear communication ^(9, 12) - assessing the impact and feasibility of adaptation options ⁽⁹⁾ - enhancing awareness that a balance between immediate and long-term needs should be followed ⁽⁴⁾ - documenting well what influences the process fundamentally ⁽¹²⁾
Available options are unsatisfactory for policy makers	- introducing a list of possible adaptation options ^(2, 5, 6, 9, 11) - suggesting different approaches (e.g. guiding questions) for appraising options ^(1, 6, 9, 12) - assessing benefits of adaptation measures ^(3, 7) - testing each option against a range of scenarios to view the performance of each option ⁽¹⁾
Policy implementation	
Key barriers and related issues	Information provided in guidelines on how to overcome these barriers
Policy is politically/ administratively infeasible	
No adequate technological solutions available	
Legal issues	- modifying existing policies, practices and procedures and enabling environment in which adaptation can thrive ^(2, 3, 6, 9, 12)

Policy monitoring and evaluation	
Key barriers and related issues	Information provided in guidelines on how to overcome these barriers
Complexity of policy impacts and outcomes	- setting clear objectives and targets towards implementation ^(2, 9, 10, 12)
Lack of experience	<ul style="list-style-type: none"> - establishing adaptation indicators to measure progress ^(6, 9) - carrying out evaluation periodically in order to incorporate new information and to re-assess priorities, objectives and delivery mechanisms ^(5, 9) - involving stakeholders in order to encourage social and institutional learning on adaptation ^(2, 9)

Sources: (1) Willows & Connell 2003; (2) Snover et al. 2007; (3) Hilpert et al. 2007; (4) ICLEI Oceania 2008; (5) grabs project 2008; (6) Bizikova et al. 2008; (7) Parzen (Eds.) 2008; (8) Mullan et al. 2008; (9) Ribeiro et al. 2009; (10) Langlais (Eds.) 2009; (11) ECA 2009; (12) Brown et al. 2011